Name of Organization: Carnegie Mellon Research Institute

Type of Organization: College or University

Contact Information: Dr. Edwin Minkley

Environmental Technology Center

700 Technology Drive

Pittsburgh PA 15219

Phone: (412) 268 - 3188 **Extension:**

Fax: (412) 268 - 3101

E-Mail: minkley@andrew.cmu.edu

Project Title: Treating PCB Contaminated Sediments Using Zero-Valent Metals

Project Category: Contaminated Sediments

Rank by Organization (if applicable): 1

Total Funding Requested ($): 83,907 **Project Duration:** 1 Years

Abstract:

The Carnegie Mellon Research Institute Environmental Technology Center (CMRI-ETC) proposes to conduct a study involving laboratory-scale testing of an "on-the-ground" treatment scheme for decontamination of PCB-contaminated Lake Erie sediments using proprietary zero-valent metal preparations and treatment processes. This research will help to determine operational scenarios that promote the treatment of contaminated sediments via chemical dechlorination of PCBs. Contamination of sediments with PCBs is a concern throughout the Great Lakes Region due to their persistent bioaccumulative nature. CMRI-ETC plans to select several Lake Erie sediment samples for evaluation after consultation with appropriate state and federal regulatory agency personnel, and also based on the sampling schedule for the R/V Lake Guardian. The selected sediments will be subjected to up to four (4) treatment schemes to determine the optimal conditions which promote reduction of PCB contamination.

Geographic Areas Affected by the Project

States:

- [ ] Illinois
- [ ] Indiana
- [ ] Michigan
- [ ] Minnesota
- [x] New York
- [x] Pennsylvania
- [ ] Wisconsin
- [x] Ohio

Lakes:

- [ ] Superior
- [ ] Huron
- [ ] Michigan
- [x] Erie
- [ ] Ontario
- [ ] All Lakes

Geographic Initiatives:

- [ ] Greater Chicago
- [ ] NE Ohio
- [ ] NW Indiana
- [ ] SE Michigan
- [ ] Lake St. Clair

Primary Affected Area of Concern: All AOCs

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Sediments throughout the Great Lakes Region are contaminated with PCBs and other chlorinated materials such as dioxins, and the pesticides DDT, DDE, chlordane and mirex. Many Great Lakes AOCs are under fish consumption advisories, have dredging restrictions, or suffer other beneficial use impairments. In some cases, however, sediment dredging is required to permit continued navigation. The treatment/disposal options for these dredged materials are limited, and land disposal of these contaminated sediments does not provide a terminal treatment option. However, "on-the-ground" treatment of these sediments using zero-valent metals technologies has the potential to reduce the PCB concentration in these sediments, thus reducing the long-term risks associated with disposal, and potentially allowing beneficial reuse.

Proposed Work Outcome:

Prior work conducted by CMRI-ETC and others has proven that chlorinated aliphatic chemicals such as trichloroethylene (TCE), tetrachloroethylene (PCE), and hexachlorobutadiene (HCBd) can be dechlorinated by treatment with zero-valent iron or palladized iron in both water and sediments. Iron or palladized iron treatment of chlorinated aromatics such as hexachlorobenzene (HCB) has been unsuccessful in sediments. However, new proprietary zero-valent metal preparations and treatment processes developed by CMRI-ETC (which are the subject of an invention disclosure at Carnegie Mellon University) have been shown to fully dechlorinate HCB and pentachlorobenzene (PeCB) in both water and sediments.

The main outcome of this project will be to demonstrate the applicability of this newly developed CMRI dechlorination technology to the "on-the-ground" treatment of sediments contaminated with PCBs and pesticides. Therefore, CMRI-ETC proposes to conduct laboratory-based studies using contaminated sediments from Lake Erie to determine the optimal conditions to promote dechlorination of the PCBs and/or chlorinated pesticides contained in them. PCB/pesticide analyses will be primarily performed in-house at the CMRI-ETC analytical laboratory, with appropriate confirmatory analyses being performed by an outside contract lab. PCB analyses will be used to determine the effect of the CMRI zero-valent metals treatment system on PCB content of the sediments in terms of residual chlorine. Dechlorination patterns will also be analyzed. The major components of this project are as follows:

Sediment Chemistry:

Sediment chemistry parameters will be limited to PCB, biphenyl and/or pesticide analysis. The sediments to be utilized will be selected in cooperation with appropriate state and federal regulatory agencies and dependent upon the availability of the R/V Lake Guardian. Sediment samples will be grab samples obtained from the surface or near-surface zones

(generally 0-20 cm).

Other Issues:
The tentative schedule for the R/V Lake Guardian shows that the vessel will be available to sample Lake Erie in mid July and/or early August. CMRI-ETC would like to receive sediment samples by late August 2000 in order to allow for preliminary analysis of the sediments and experiment setup in September. In order for this schedule to be maintained, CMRI-ETC would need to have the grant awarded by July 1, 2000.

Project Milestones:	**Dates:**
QAPP	08/2000
Field Sampling	08/2000
Phase I Experimental Setup	10/2000
Phase II Experimental Setup	02/2001
Final PCB Sediment Analysis	05/2001
Final Report	07/2001
Project End	07/2001
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☐ Project Addresses Environmental Justice

If So, Description of How:

☒ Project Addresses Education/Outreach

If So, Description of How:

The results of this program will be used to advise applicable state and federal regulatory agencies and also the Sediment Remediation/Contamination Work Groups throughout the Great Lakes Region of the availability and applicability of a new remedial technology for on-the-ground treatment of PCBs and pesticides in sediments. In addition, results will be disseminated through peer reviewed scientific publications.

Project Budget:

	Federal Share Requested ($)	Applicant's Share ($)
Personnel:	33,750	4,000
Fringe:	7,965	900
Travel:	2,000	0
Equipment:	0	0
Supplies:	6,000	0
Contracts:	4,000	0
Construction:	0	0
Other:	2,000	0
Total Direct Costs:	55,715	4,900
Indirect Costs:	28,192	2,479
Total:	83,907	7,379
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

8.8% of the entire project costs will be provided in cash or in-kind contributions and other non-cash support from CMRI.

Description of Collaboration/Community Based Support:

Collaborative support will be needed from the appropriate state and federal regulatory agencies to assist in sediment selection. Support will also be required from GLNPO for using the R/V lake Guardian.